

## RESTING POSTURE IN THE LEPIDOPTERA

By M.W.F. TWEEDIE

*Barn House, Rye, Sussex TN31 7PJ.*

By reason of the development of a mosaic of overlapping scales on their wings the Lepidoptera have come to display a remarkable degree of diversity in coloration and pattern. Correlated with this, often in such a way as to produce cryptic and other adaptations, they have evolved a diversity in their resting postures, particularly in the disposition of their wings, far greater than that found in any other insect order. It is true that not all the peculiarities of posture are obviously adaptive, but it must be remembered that diversity in itself provides protection against predation by increasing the number of searching images needed by predators that hunt by sight.

It is customary to dispose collections of butterflies and moths in a way that best displays their wing coloration, but in almost all cases this wholly obscures the resting posture of the living insect. It is my purpose in this paper to present a very brief introduction to a hitherto rather neglected branch of entomology, that of photographically recording the appearance of insects in life. The Lepidoptera, for reasons I have stated, are the most obvious candidates for a systematic study of this kind.

For an indication of the primitive lepidopteran posture it seems reasonable to look at one of the most primitive groups within the order, the Hepialidae. All the swift moths that I have observed hold their fore-wings, when at rest, directed backwards forming a steep ridged roof covering the hind-body. Support for considering this a primitive posture is given by its invariable occurrence in the Trichoptera or caddis flies, which are generally regarded as less highly evolved relatives of the Lepidoptera.

The ridged-roof mode of holding the fore-wings together is often met with in other Lepidoptera, in some perhaps as a persistent character, probably more often as a secondary one. It is seen in the 'prominents' of the family Notodontidae, in which a disrupted outline is produced by scale-tufts on the dorsal margin of the fore-wings. Among the Noctuidae the metallic-marked Plusiinae rest in a similar position. In most of the larger moths which rest with the hind-wings concealed these are folded like a fan.

The first stage leading away from the primitive stance consists of a progressive flattening of the 'roof' until the fore-wings lie horizontally, meeting in the middle line, a condition seen in some of the Hypeninae and in the herald moth, *Scoliopteryx libarix* L. In many of the more heavy-bodied moths the flattening of the fore-wings is accompanied by a tendency for them to overlap at the tornus or for the greater part of their length. This posture is seen in a great many species of Noctuidae and also in the much more slender-bodied Lithosiinae or footman moths.

In the direction contrary to overlapping fore-wings are cases where they do not meet or approach closely in the middle line, so that the abdomen is exposed. This is seen in the Sphingidae, in which the hind-wings are usually almost or quite covered, producing an arrow-head shape in the resting insect. The poplar hawk-moth, *Laothoe populi* L., is exceptional in carrying the hind-wings pushed so far forward that they appear in front of the costa of the fore-wings, breaking up the insect's outline and producing a striking cryptic effect. The wings are similarly disposed in the lappet, *Gastropacha quercifolia* L., producing a remarkable resemblance to a bunch of dead leaves.

Many geometrids sit as I have described for the Hypheninae, flattened against the substratum with the fore-wings covering the hind-wings. The abdomen may or may not be covered, and in a few species it is completely concealed by the overlapping fore-wings; the March moth, *Alsophila aescularia* D. & S. is an example of this and the Streak, *Chesias legatella* D. & S. affords another. Species with a flattened posture in which all four wings are exposed are numerous among the Geometridae. Most of the 'pugs' (*Eupithecia*) rest in this posture with the hind-wings wholly or partly uncovered, and some of the 'waves' show it in a rather extreme form. In such cases the hind-wing is usually marked and coloured similarly to the fore-wing, but in geometrids the hind-wings are seldom patterned if they are concealed.

Most of the Pyralidae rest flattened and the hind-wings may be exposed or hidden. *Nomphila noctuella* and the Scopariinae overlap their fore-wings and most of the Crambinae wrap the fore-wings round the body to produce an elongated image for crypsis among grass stems.

The familiar butterfly posture with the wings closed over the back provides the advantage of enabling the insect to present two totally different appearances. The comma, *Polygonia c-album* L., feeding on a flower with wings spread advertises its identity to others of its species, at the same time remaining alert for danger. With its wings closed in hibernation among winter foliage it becomes virtually invisible. Some geometrids rest in the wings-over-back position, but usually only as a temporary 'perching' posture.

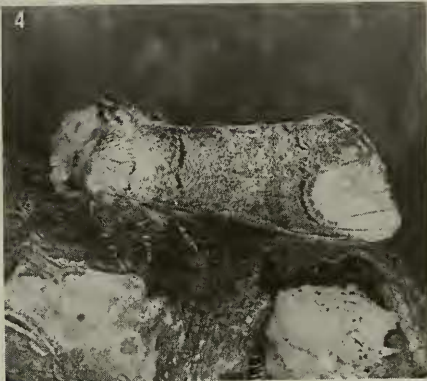
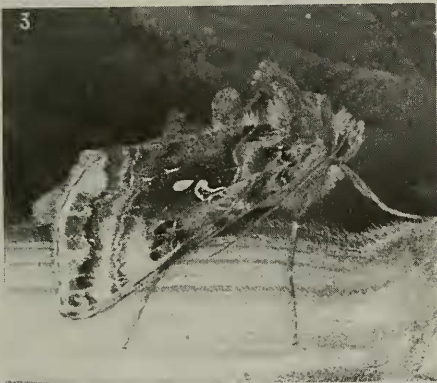
I have described what I see as the main trends in lepidopteran posture by reference to British insects. Some peculiar departures from the usual pattern are shown among the photographs in Figs 1 to 24 (pages 3-6). In conclusion I propose to illustrate the enormous scope for enquiry in this field among exotic faunas by describing two tropical encounters.

Figs 1-6, page 3.

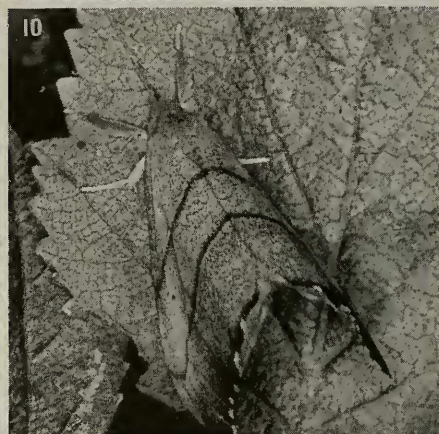
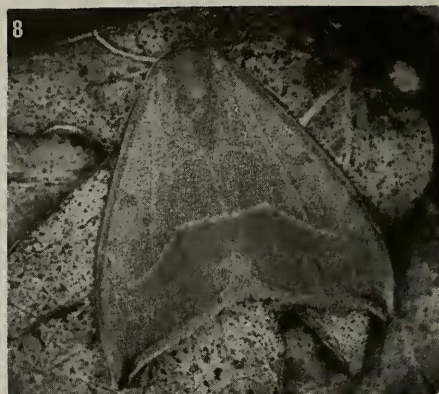
Fig. 1. Common Swift, *Hepialus lupulinus* L. The swift moths display what may well be the primitive lepidopteran resting posture. Fig. 2. Pale Prominent, *Odontotia palpina* Cl. Fig. 3. Beautiful Golden Y, *Autographa pulchrina* Haw. Neither of these are primitive moths but they have a resting posture very like that of the hepialids. In both the 'prominents' and the Plusiinae the dorsal profile is disrupted by projecting tufts; these are of scales arising from the fore-wings in the prominents and of hair on the thorax and abdomen in the plusiines. Fig. 4. Buff-tip, *Phalera bucephala* L. This is a supreme example of posture and coloration combining to produce a cryptic adaptation, in this case resemblance to a broken twig. Fig. 5. Striped Hawk-moth, *Hyles lineata livornica* Esp. This 'arrow-head' posture, with the abdomen exposed between the wings, is typical of the Sphingidae. Fig. 6. Poplar Hawk-moth, *Laothoe populi* L. This moth is unusual among the sphingids in advancing the hind-wings when at rest so that they are broadly exposed in front of the fore-wings.

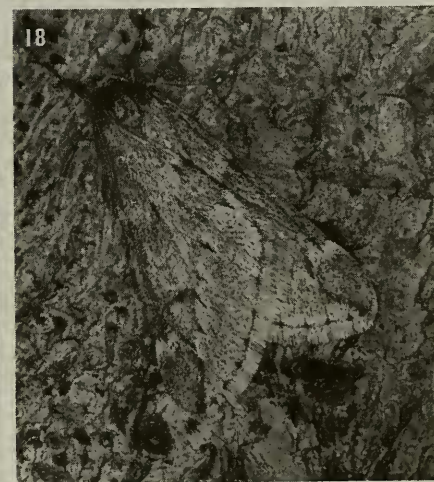
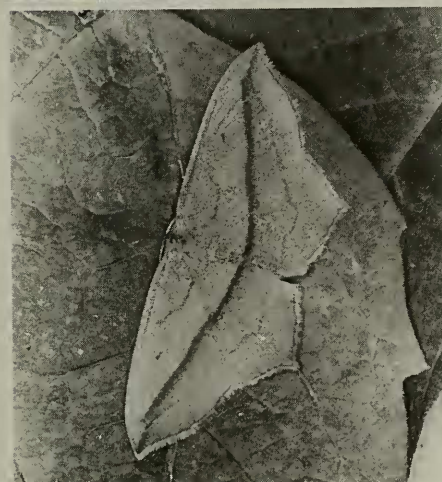
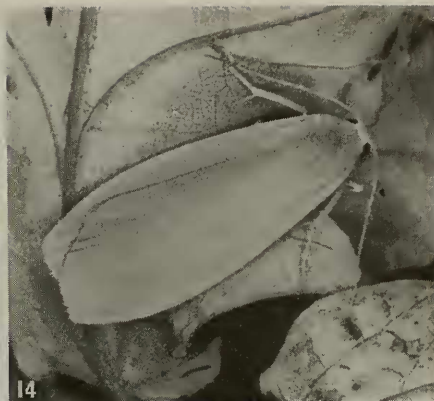
Figs 7-12, page 4.

Fig. 7. Small Skipper, *Thymelicus sylvestris* Poda. Butterflies of this genus rest in a very unusual posture with fore- and hind-wings held in two different planes. Fig. 8. Oak Hook-tip, *Drepana binaria* Hufn. Fig. 9. Chinese Character, *Cilix glaucata* Scop. Fig. 10. Scalloped Hook-tip, *Falcaria lacertinaria* L. The Drepanidae vary in their resting posture. The *Drepana* species may cover the hind-wings as in *binaria* or expose them behind the fore-wings (*falcataria*). *C. glaucata* has a stance probably associated with its mimicry of a bird-dropping. That of *F. lacertinaria*, with the wings curved to form an arch, is very unusual. Fig. 11. Small Fanfoot, *Herminia nemoralis* Fabr. Here the fore-wings are disposed to form a triangle covering the hind-wings. Fig. 12. Obscure Wainscot, *Mythimna obsoleta* Hb.

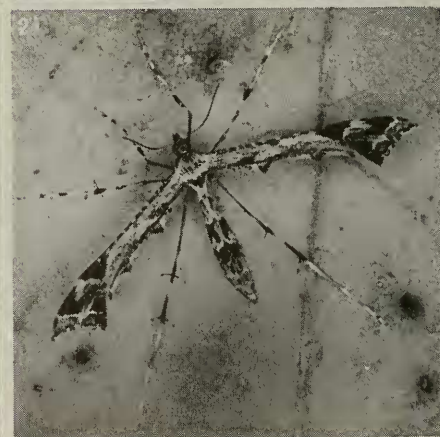
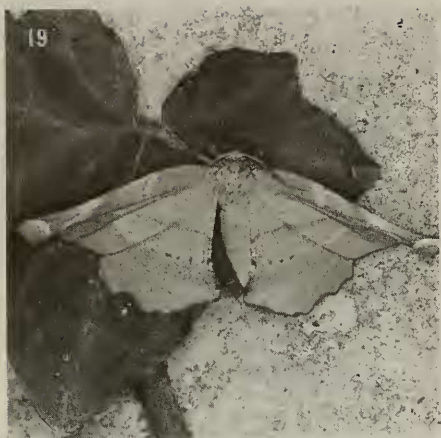












In 1977 I was on a path in rain forest in the Solomon Islands and noticed what I took to be small butterflies fluttering and settling around me. Having some book-knowledge of the butterflies of the region I found myself momentarily wondering

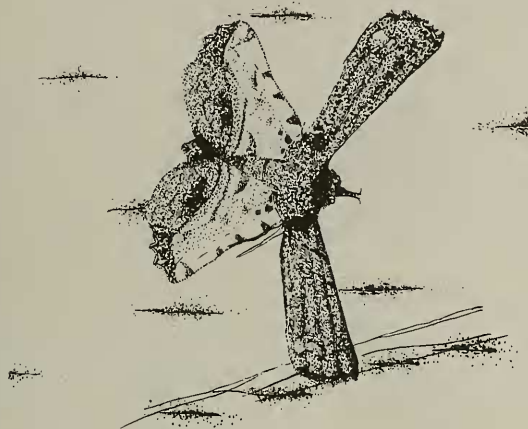


Fig. 25. A moth of the family Epiplemidae, Peru.

Figs 13–18, page 5.

Fig. 13. Autumnal Rustic, *Paradiarsia glareosa* Esp. In the Noctuidae there is a tendency to direct the fore-wings backward so that they overlap, at the tornus (*obsolata*) or more extensively (*glareosa*). Fig. 14. Dinky Footman, *Eilema griseola* Hb. In the arctiid genus *Eilema* there is an extreme degree of overlap of one fore-wing over the other. Fig. 15. Green Carpet, *Electrophaes pectinataria* Knoch. The flat triangular posture with the hind-wings concealed is very general among the Geometridae. Fig. 16. Small White Wave, *Asthena albulata* Hufn. Here all four wings are exposed in a flattened stance, and the fore- and hind-wings are similarly marked. Fig. 17. Blood-vein, *Timandra griseata* Peters. This geometrid affords an outstanding example of coincident pattern, the dark streaks on fore- and hind-wings being continuously aligned in the natural resting posture. Fig. 18. March Moth, *Alsophila aescularia* D. & S. The posture involving overlapping fore-wings is rare among the Geometridae.

Figs 19–24, page 6.

Fig. 19. Lilac Beauty, *Apeira syringaria* L. Folding of the fore-wings along the costal margin occurs uncommonly among the larger moths. This species is a geometrid; the condition is also seen in the noctuid Angle Shades, *Phlogophora meticulosa* L. Fig. 20. Barred Straw, *Eulithis pyraliata* D. & S. In an unusual posture all four wings are directed forwards, the hind-wings being concealed under the fore-wings. Fig. 21. Mother of Pearl, *Pleuroptya ruralis* Scop. Most of the Pyraustinae (Pyralidae) rest in this posture or as a flat triangle. Fig. 22. *Agriphila geniculea* Haw. The grass moths (Crambinae) achieve an elongate shape by rolling the wings round the body. Fig. 23. *Emmelina monodactyla* L. Fig. 24. *Platyptilia calodactyla* D. & S. In the plume moths (Pterophoridae) the deeply dissected hind-wings are always concealed and the fore-wings may be tightly rolled, as in *monodactyla*. It will be seen that in this species the hind legs are laid back along the abdomen and are not involved in supporting the insect at rest; in *calodactyla* all six legs are used in support. It is possible that these two modes of disposing the legs are characteristic of the two subfamilies Pterophorinae and Platyptiliinae.



Fig. 26. A moth of the family Callidulidae, Solomon Islands.

what on earth they could be. Close inspection revealed them as callidulid moths, a family found mainly in tropical Asia and Australasia. Their diurnal flight and wholly rhopaloceran resting posture must, I am sure, have briefly puzzled other naturalists beside myself.

The Epiplemidæ, which might well be called 'cross-wings', are small moths with a circumtropical distribution and a very curious and distinctive posture. I found one of these sitting on the palm-leaf wall of my sleeping quarters in a camp beside the river Madre de Dios in eastern Peru on a visit in 1980. I cannot identify either this or the callidulid beyond the family, but on both occasions I had the means to photograph the insects and the drawings (Figs 25 and 26) were made from my colour slides.

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## BOOK REVIEW

**Nature Diary of a Quiet Pedestrian** by Philip Croft. Harbour Publishing Co, Madeira Park, British Columbia, Canada. 141 pages.

This attractive publication documents the natural history observations made by Philip Croft, over a calendar year, during his almost daily perambulations around a residential suburb of Vancouver. Much of that recorded could well have been noted under similar conditions around many a British coastal conurbation. The Palearctic is a common factor of both regions and many species were transports from Western Europe, either deliberately or accidentally, by those human migrants to the west coast of Canada. As well as the familiar, the reader is also given many a tantalizing glance at that different and larger flora and fauna which is characteristic of the North American land mass—humming birds, black bears and the Pine White butterfly are to be seen as well as the Holly and Ivy and the Small Cabbage White butterfly, these latter three being two deliberate and one accidental introductions from Europe.

Philip Croft, a long standing member of our Society, prepared this book just before he died. In addition to the somewhat lyrical text there are many delightful colour illustrations and line drawings from the same hand. We are fortunate that his family decided to publish posthumously as we are now able to enjoy what is a fitting tribute to a true lover of nature who was, incidentally, an ex-patriate Englishman himself.

P. J. BAKER